INFLUENCE OF N-NO_3 AND N-NH_4 ON THE MINERAL COMPOSITION OF GRAPE-VINE ROOTSTOCKS CULTURED *IN VITRO.*

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Abstract

$NaNO_3$ treatments, induced an important accumulation of Na (r=0.986) caused by the presence of Na ion in the salt and a small increase of N (r=0.953) and decrease of Ca (r=-0.904). The other nutrients considered were not altered.

$(NH_4)_2SO_4$ treatments caused a very large accumulation of N (r=0.974), P (r=0.967) and Fe (r=0.985) and at the same time an important decrease of K (r=-0.959).

1. Introduction

NH_4NO_3 concentration clearly affects growth, quality and mineral composition of grape explants cultured *in vitro* (Troncoso et al., 1990). With the aim of knowing the specific influence of each ion on the mineral composition of explants, different concentrations of N-NO_3 and N-NH_4 were studied.

2. Material and methods

Homogeneous, 10 mm long explants of grape-vine rootstocks 13.3 EVEX, 161-49 and 41B were cultured *in vitro* at a temperature of 25 ºC, light intensity of 2500 lux and 16 h photoperiod.

The treatments were: control with basal subtrate (Table 1) (Villegas, 1990); five $NaNO_3$ concentrations added to the control medium 5, 10, 15, 20 and 25 mM of N of the salt; and five $(NH_4)_2SO_4$ concentrations added to the control medium 5, 10, 15, 20 and 25 mM of N of the salt, respectively. Each treatment involved 24 explants (8x3 replicates).

After 30 days of culture, each group (treatment) of explants was analysed, determining N, P, K, Ca, Mg, Na and Fe (Pinta et al., 1969; 1973).

Table 1. Composition of the basal nutritive medium

Chemical compound	mM	Chemical compound	uM	Chemical compound	mM
KNO_3	7.91	$MnSO_4.4H_2O$	5.0	M-inositol	27.75
$Ca(NO_3)_2.4H_2O$	1.27	H_3BO_3	100.0	Thiamine	2.96
KH_2PO_4	1.25	$ZnSO_4.7H_2O$	30.0	6-BAP	4.43
$MgSO_4.7H_2O$	1.50	$Na_2MoO_4.2H_2O$	1.0	IBA	0.48
$FeSO_4.7H_2O$	0.09	$CuSO_4.5H_2O$	0.1	Sucrose	30 $g.L^{-1}$
Na_2EDTA	0.10	$CoCl_2.6H_2O$	0.1	Agar	6 $g.L^{-1}$

3. Results

As all the rootstocks showed a similar behaviour, Fig. 1 shows the levels of nutrients as average of the three rootstocks.

Mineral composition of the explants was altered little by $NaNO_3$ applications, except for an important Na accumulation (r=0.986) caused by the presence of Na ion in the salt. Probably related with this Na accumulation a decreased level of Ca (r=-0.904) was obtained, but P, K and Mg practically did not change except for a little increase between control and treatments. Despite the high availability of N in the medium, the level of N of the explants showed only a small increase (r=0.974), showing a highly controlled $N\text{-}NO_3$ absorption, probably affected by the process of reduction that $N\text{-}NO_3$, with intervention of NO_3-reductase and high energy consumption, suffers before being metabolized (Ullrich, 1987).

On the contrary, $(NH_4)_2SO_4$ treatments caused important modifications in the mineral composition of the explants (Fig. 1). It increased significantly the levels of N (r=0.974), P (r=0.967) and Fe (r=0.985) and decreased K (r=-0.974), with little, non significant, changes in the contents of Ca, Mg and Na. Similar results were shown by Troncoso et al., (1990) for NH_4NO_3 additions.

In consequence and according to Fowler et al., (1982) the absorption of $N\text{-}NH_4$ was higher and less controlled than $N\text{-}NO_3$ provoking high contents in N of tissues and parallelly inducing alterations in other nutrients. This specifically resulted in very low levels of K. However, the very necessary application of $N\text{-}NH_4$ to the nutritive medium to get a sufficient and quick availability of N, must be controlled because the excess of $N\text{-}NH_4$ would be toxic for the explant (Vieitez et al., 1983).

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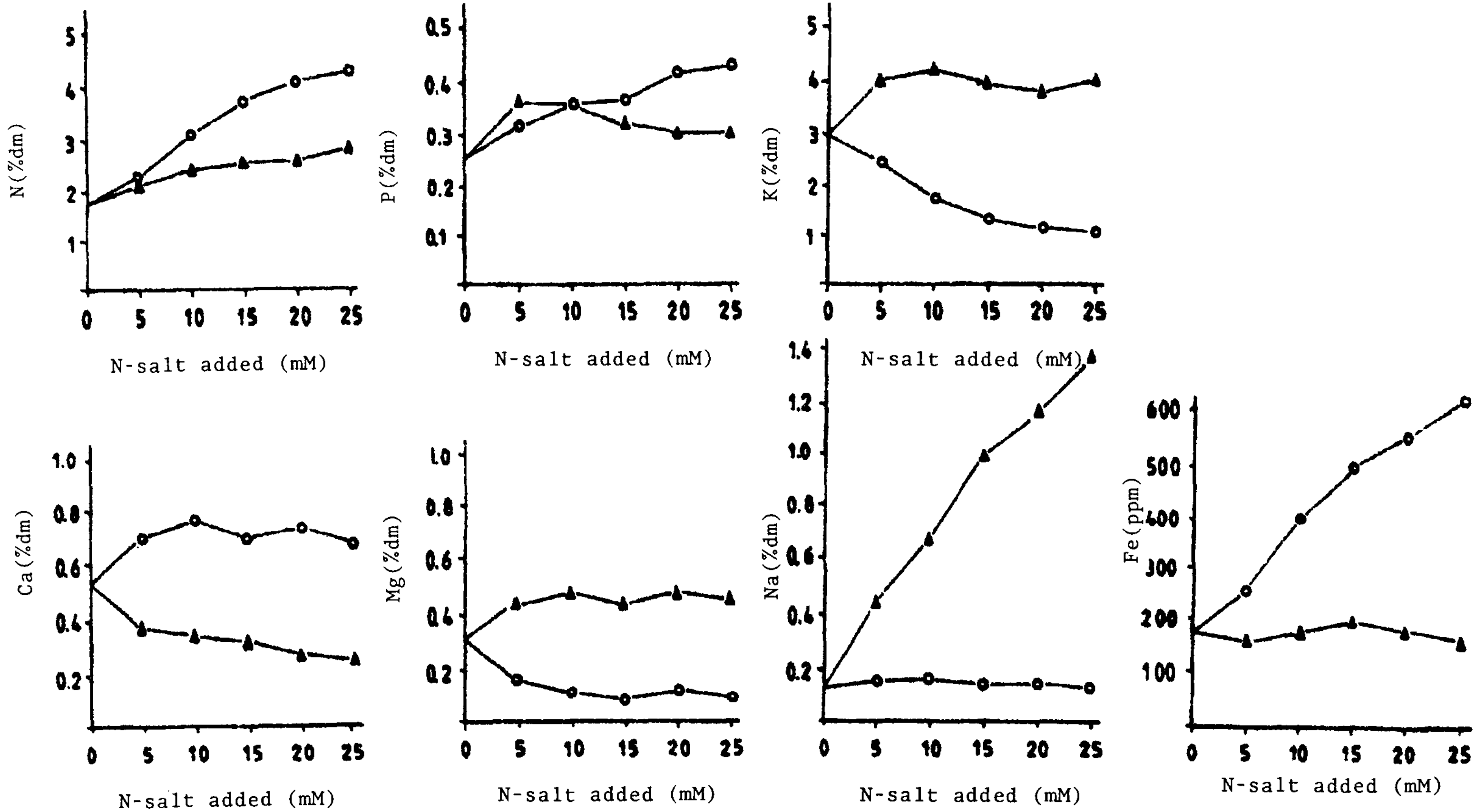

Figure 1. Contents of nutrients (average of three rootstocks) in relation to N-treatments

△ - $NaNO_3$

○ - $(NH_4)_2SO_4$